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UNITED STATES DEPARTMENT OF AGRICULTURE
Research Program Development and Evaluation Staff
Washington, D. C. 20250

REPORT AND RECOMMENDATIONS OF THE
FIRST MEETING OF THE
COTTON RESEARCH ADVISORY COMMITTEE

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JUL 27 1965

March 8-11, 1965
Washington, D. C.

CURRENT SERIAL RECORDS

Membership of the
Cotton Research Advisory Committee

Mr. John M. Barrell, Assistant Vice-President, Mount Vernon
Mills, Inc., Baltimore, Maryland

Dr. John P. Elting, The Kendall Company, Charlotte,
North Carolina

Mr. Jack Funk, Harlingen, Texas

Dr. William L. Giles, Vice-President for Agriculture,
Mississippi State University, State College, Mississippi

Dr. Thomas W. Gilmore, Jr., Fern Crest Plantation,
Sandersville, Georgia

Dr. Scott Hathorn, Jr., Ranching Department, J. G. Boswell
Company, Corcoran, California

Mr. Jack W. Kidd, President, Farmers & Ginners Cotton
Oil Company, Birmingham, Alabama

Dr. Harold D. Loden, Paymaster Seed Farms, Plainview, Texas

Mr. Robert A. Montgomery, Secretary and Field Director,
Staple Cotton Cooperative Association, Greenwood, Mississippi

Mr. George H. Struthers, Vice-President, In Charge of
Merchandising, Sears, Roebuck and Company, Chicago, Illinois

PREFACE

The first meeting of the newly reconstituted Cotton Research Advisory Committee was held in Washington, D. C., on March 8-11, 1965. All members were present except Mr. George H. Struthers, who was unable to attend. The Committee made a systematic review of the Department's cotton research program. The primary basis for this review was the Cotton Research Progress Report prepared especially for the Committee's use. This source of information was supplemented by oral reports from the following USDA research Divisions: Crops, Entomology, Agricultural Engineering, Southern Utilization Research and Development, Market Quality, Transportation and Facilities, Economic and Statistical Analysis, Marketing Economics; and Statistical Reporting Service, and Farmer Cooperative Service.

Additional information was presented regarding research needs in the cotton industry at the public session meeting on March 8, 1965, by the following persons: Dr. George S. Buck, Assistant to Executive Vice-President (on Technical Research), National Cotton Council, Memphis, Tennessee; Mr. B. F. Smith, Executive Vice-President, Delta Council, Stoneville, Mississippi; Mr. Donald A. Johnson, Executive Assistant, Plains Cotton Growers, Inc., Lubbock, Texas; Mr. Carl Cox, Director, The Cotton Research Committee of Texas, Dallas, Texas; Mr. Edward H. Bush, Executive Vice-President, Texas Cotton Ginners' Association, Dallas, Texas; the Arkansas-Missouri Cotton Ginners Association, West Memphis, Arkansas (report given by Mr. B. F. Smith, Delta Council); and Mr. Garlon A. Harper, Director, Research and Education, National Cottonseed Products Association, Inc., Memphis, Tennessee.

Dr. Nyle C. Brady, Director of Science and Education, Office of the Secretary, USDA, served as Chairman of the Committee; and Mr. Carl P. Heisig, Deputy Administrator, Economic Research Service, USDA, served as Vice-Chairman.

After a careful review of all the material available, the Committee submitted the following recommendations to the Secretary of Agriculture.

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Additional copies of this report may be obtained from James F. Lankford, Executive Secretary of the Cotton Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C. 20250

COTTON RESEARCH ADVISORY COMMITTEE
REPORT AND RECOMMENDATIONS

GENERAL COMMENTS

The Committee recognizes the continuing and vigorous pursuit of basic research as the lifeblood of a strong and profitable cotton industry in this nation. It further recognizes in the USDA the one entity which--by virtue of representing the vast number of citizens engaged directly in or affected indirectly by the culture, handling, and processing of cotton and its products--can initiate, foster, and promulgate such research from the discovery of knowledge to the application of principle in agriculture, industry, and commerce.

The Committee again commends the Secretary of Agriculture for his action in creating the Office of Director of Science and Education, and in securing to fill it a scientist of outstanding ability in the several facets which such a responsibility demands. The Committee renews its recommendation that this post be made permanent at the Assistant Secretary level.

The Committee commends the Congress for providing in fiscal year 1965 the initial \$2 million to begin the cotton cost-cutting research program and urges now that the additional funds for full implementation be made available so that the Department may proceed promptly with construction and staffing of the facilities essential to that end.

We recommended last year in the section on fiber quality and marketing that special attention be given to the development of instruments to accurately determine the parameters which characterize the cotton fiber which, in various combinations, can be used to predict its behavior in spinning and in the spun yarn; and which, therefore, will come eventually to be accurate determinants of the value of the fiber.

The Committee has witnessed and recognizes now the fact that the need for specific measurements has led researchers in various segments of ARS to independently develop instruments to meet their individual needs. After serious consideration of the current reports and the events of the past 2 years, the Committee submits to the Department the following recommendations and comments:

1. That measurements of each and every fiber property are basic to all phases of cotton research, either directly or indirectly.
2. That the requirements of the end-user must be analyzed into the components characterizing cotton fiber and that this information must move as rapidly as possible from the textile mill through every prior segment of the industry down to the plant breeder if maximum economic potential of the fiber is to be realized and dead-ends in research be avoided.

3. That it is to the general good that the entire industry become acquainted with and determine in the field the meaning of such measurements before they enter into the formal pricing structure.
4. That multiple approaches to each problem of measurement are fully warranted.
5. That contracts with private firms for research and development of instruments to the stage of classing-office capacity often offer the fastest route to that end and should be used to the maximum extent possible. In particular, the Committee would direct attention to the immediate need for measurement of fiber length and length distribution and to the fact that with instruments of satisfactory accuracy already in commercial use, development of adequate capacity for full-scale utilization would be best served by such a contract.
6. That all contract and intramural work on instrumentation for fiber characterization be placed under the authority of one senior scientist so that no personnel or funds are wasted in duplication and so that impetus on all essential segments of this research and development can be maintained. Only in this fashion can work done in parallel be complementary rather than diluting--and only thus can emphasis be shifted speedily to the most promising avenues.

The Committee commends and urges the maintenance at an accelerated rate of the work at the Southern Regional Laboratory on permanent-press and the other easy-care finishes to preserve and expand cotton's markets. In addition, it is of equal urgency that the laboratory pursue flame-proofing and retarding treatments incorporating durability and effectiveness, and avoiding altering the desirable characteristics of cotton for such items as sheets, bedding, etc.

The Committee recognizes the immediate need for definition of the factors which lead to production of undesirable molds in cottonseed and for the development of preventive techniques and countermeasures.

The Committee recognizes the need for maintaining a stimulating environment for the scientists of the Department and commends the work of the Task Force to Study Training and Environment. In particular, it commends the opportunities and incentives given by the Department to its scientists for further academic training.

The Committee wishes to express its appreciation to the Department for being returned to its status of dealing with cotton and cottonseed only, believing that it can more effectively serve by considering all of cotton's products and by avoiding dilution of its time in becoming familiar with research problems of other commodities.

To the representatives of industry who addressed the Committee, it expresses its great appreciation for their willingness to attend the session and for the focus on problems which they provided.

FARM RESEARCH

A. Culture and Physiology

1. Obtaining Uniform Stands - The Department is to be commended for its fundamental research program dealing with factors which influence seed germination and seedling emergence. It is recommended that this research be continued. As basic knowledge is advanced, a multidisciplinary applied research program should be developed to show the way to obtain uniform stands of vigorous seedlings.

2. Environmental Factors Which Influence Development of the Cotton Plant - Scientists of the Department and producers of cotton recognize the need for more basic research in the field of ecology. Plant physiology and related disciplines can expand the rather limited knowledge of environmental factors which influence the growth and fruitfulness of the cotton plant.

Planning funds made available for fiscal year 1965 should be used to develop necessary plans for two new physiology laboratories. Recruitment of competent staffing of the laboratories should be started immediately.

3. Defoliation - The Committee recognizes the importance of proper removal of leaves from the cotton plant prior to harvest and takes particular recognition of contributions of defoliation research to cotton quality and subsequent potentials for cost reduction in ginning and processing; and further recognizes that present defoliation and desiccation practices do not generally and adequately accomplish desired results. The Committee suggests that the eventual solution to this problem is dependent upon efforts in basic research on the physiology of abscission such as are now being conducted by scientists at the University of California. The Committee commends ARS for its research efforts carried out in cooperation with industry groups and recommends that they be continued and expanded.

B. Weed Control

1. Excellent progress has been made in developing efficient weed control practices. The cooperative Federal-State research effort is the heart of this accomplishment. The Department is to be commended for its leadership in helping to maintain superior working relationships with the States and with industry.

Expensive weed control problems still exist for the cotton producer; therefore, there must be no reduction in the weed research effort.

2. The Committee is gratified that funds were appropriated for a new Southern Weed Research Laboratory in fiscal year 1965.

3. New and exciting developments in the field of plant physiology resulting in a better understanding of the processes of growth seem to offer possibilities for weed control which could reduce the use of chemicals. Interdisciplinary research appears to offer splendid opportunities for accomplishment. Research in this field should be encouraged.

4. Research on the effectiveness of new chemicals for weed control and their fate in cotton products and soils should continue to receive major attention. Work underway on screening new materials and the influence of chemical structure on herbicidal properties should be continued.

C. Insect Control

1. The Department is to be commended for its vigorous and imaginative research on the boll weevil. This work should be supported to the fullest possible extent. There are, however, a number of major cotton insect pests which have received too little attention. Boll worms, plant bugs, and spider mites take a heavy toll in reducing cotton yields and are expensive to control. Resistance to insecticides in these pests and others indicates the need for an aggressive research program to find means of control other than insecticides.

2. Identification of the sex lure in pink boll worm opens up an exciting possibility for insect control. Special emphasis should be given to research which will show the way to use this new device in control.

3. Recent research and practical experience indicate that low volumes of concentrated insecticides effectively control a number of cotton insect pests. Additional research is needed to develop efficient application equipment and methods of application which will minimize drift. Immediate attention needs to be given this matter in view of the fact that growers will use concentrated materials during the 1965 season.

4. Insect resistance to insecticides and human health hazards from chemical residues demand new approaches to the control of insect pests. Entomological research in the Department and at the State Experiment Stations indicates that there are other ways of reducing insect populations. There is substantial evidence that, in the very near future, pest populations will be managed through the intelligent use of predators, parasites, disease organisms, attractants, repellents, and other agents. In order to apply the knowledge we now have of these agents, it is quite clear that research must be accelerated in the following areas: chemistry of attractants and stimulants; screening for chemosterilants; field use of viruses; and biology of predators and parasites.

Additional facilities are needed to rear the huge numbers of insects which will be required by these research programs.

D. Breeding, Variety Evaluation, and Disease Control

The Cotton and Cordage Fibers Research Branch is to be commended for its accomplishments in upgrading personnel and job responsibilities, particularly as reflected in a major shift in effort during the past few years from development and release of commercial varieties to the development of basic knowledge on the genetics, physiology, biochemistry, and growth processes of the cotton plant which will be of immeasurably greater long-range value to the cotton industry. Continued reduction in number of professional employees conducting applied research with a shift to efforts in basic research is encouraged.

The interdisciplinary approach to basic research is recognized as having greater probability of providing solutions to important problems of long standing. Efforts to date are commended, and the continued expansion of interdisciplinary research efforts is recommended.

The cost to the cotton industry due to disease losses has been recognized and establishment of a Cotton Disease Laboratory at College Station, Texas, has been authorized. It is recommended that actions be taken to insure construction and adequate staffing of the facility at the earliest possible date.

The increasing magnitude of the Verticillium wilt problem in large and highly productive areas of the Cotton Belt poses a problem of great importance to the industry in its efforts to reduce production costs. A well-planned, comprehensive, interdisciplinary attack on this problem is of utmost importance.

The National Cotton Variety Testing Program has resulted in accumulation and distribution of data relative to Belt-wide responses of varietal types which has not previously been available. The efforts of ARS in planning and conducting these tests is of immeasurable value to scientists in the fields of genetics, physiology, and commercial plant breeding. Assistance in continuation of this program is recommended.

Notice is taken by the Committee of the work conducted in several areas of ARS research on development of glandless varieties of cotton which will be advantageous to the cottonseed industry by aiding in cost reductions and improvement of competitive position of cottonseed products. These activities should be continued to their logical conclusion which will result in availability of basic glandless seed stocks to be used in final production of gossypol-free cottonseed products.

E. Soils

Investigation of the physical and chemical properties of mid-south and southeastern soils (similar to those pursued at Shafter, California) is urgently needed. Problems with poor taproot development and consequent severe limitation of yield potential

are appearing with rapidly increasing frequency throughout the Southeast. Research on primary factors involved and development of engineering and chemical methods of correction are of major importance.

Preliminary announcement of pending elimination of fertilizer research at Beltsville focused the attention of the Committee on the very valuable service rendered to scientists investigating growth responses of the cotton plant utilizing fertilizers formulated with radioactive materials. The Committee points out that plant scientists must have continued access to a dependable source of supply of these radioactive fertilizers which are currently being made available from this facility. The Committee requests that the Department make necessary provisions to insure a future supply source of these very vital research tools prior to contemplated closing of the Beltsville fertilizer facility in order that very vital plant response research not be interrupted.

F. Cotton Mechanization

Expansion and pursuit of research currently underway on components of planting equipment are of more vital importance than growers themselves realize; incorporation of the best information already available would, according to ample evidence, give marked improvement of stands with consequent reduction in unit costs.

Spindle harvesting equipment has not yet efficiently handled high-yielding cotton. Excessive field loss must be corrected if higher per acre yield is to be reflected in lower unit cost. The work in process on "once-over" harvesting suggests a minimum harvesting cost for the producer. An entirely new concept of mechanical harvesting may be essential to increase field efficiency. Research of this type is the particular responsibility of ARS and should be expanded and well-supported.

The Committee recognizes the importance of agricultural engineering research in development of efficient equipment and improved methodology of application of insecticides and herbicides and additional support for research in this area is recommended.

G. Cotton Ginning

The Committee has followed the development of the micro-gin at Stoneville with the greatest interest and views it as one of the most valuable tools ever developed for ginning research. Funds for planning a building with controlled atmospheres were recommended by Congress last year, but necessary funds were not included in the 1966 budget. It is recommended that the Department make every effort to secure these funds as soon as possible.

Reports by industry representatives showed that over 2 million bales of cotton are produced annually in the Texas High Plains. This cotton differs from other cotton grown in the Belt in harvesting methods used

and climatic conditions and ginning conditions. The location of present ginning research facilities are such that they do not provide the necessary answer to their problems. We believe that a ginning research laboratory should be established in the High Plains Area to provide this necessary research. This is essential to complement research in production and harvesting areas.

The increasing rougher harvesting practice being used by the producer creates an ever increasing problem on the gin to prepare cotton of the highest possible quality, and separate the large amount of trash. We heard testimony that up to 400 pounds of waste or trash was handled by some gins during each minute of ginning. To prevent the gin from becoming a public nuisance and health hazard, it is recommended that additional research be directed to the handling of gin trash.

Because of the high power requirements of a gin and cost for this power, the Committee urges that the Department redouble its efforts to reduce the amount of power requirements in a modern cotton gin. New ways of unloading and conveying should be explored to its fullest extent.

In order for USDA to better carry out its recommendations or standards for better bale wrapping and packaging, the Committee recommends that the Department encourage the use and improvement of the automatic sampler.

UTILIZATION RESEARCH

A. Basic and Exploratory Investigations

The Committee recognizes and commends the Southern Utilization Division for the soundness of the basic research that is being carried on. The Committee further wishes to emphasize the fact that the numerous outstanding applied developments owe much of their success to the firm foundation derived from the basic and pioneering work conducted at the Southern Division. The Committee recommends that these basic and exploratory research projects be continued.

B. Interrelations Between Fiber Yarns and Fabric Properties

It continues to be of utmost importance that the manufacturing segment of the industry be able to measure accurately and evaluate the spinning properties of its raw material and estimate the probable product quality before the cotton is purchased.

Programs for the creation and development of needed, novel, and new instruments must be vigorously pursued. In addition, research including necessary supporting instrumentation dealing with fiber properties not conventionally measured must be augmented. As

illustrations, such research might include studies of fiber surfaces, fiber friction, crimp, torsional rigidity, elastic properties, luster, and their interrelation among yarn, fabric, and processing properties. In the above research areas, it is important that up-to-date processing equipment be used.

C. New and Improved Textile Machinery

The Southern Utilization Division is to be most enthusiastically commended on its vigorous approach to new and radically different methods for handling cotton fibers. Such methods may well hold the key to a sound cotton industry of the future. The Committee sees the work to date merely as a beginning and wishes to urge that mechanical research be continued in this same imaginative and forward-looking vein. When and as basic findings indicate the possibility of practical utilization, development of prototypes should be pursued for the guidance of industry.

As is well known, the industry is undergoing a profound transition in all phases. In particular, those changes concerning the mechanical processing of cotton fiber into useful products are taking place so rapidly it becomes difficult for the Committee to do more than urge extreme selectivity in the choice of research projects in the development of new textile machinery.

D. Improvement of Wash-Wear Properties

Vigorous attention to further development of wash-wear processes offering unique or improved properties must continue at its present level. Research should include industrial applications, such as that of molding and durably setting. Improved finishes at lower costs are always needed.

E. Cotton Products with Special Properties

Research in this area will provide the industry with new markets and outlets, thus assuring increased utilization for cotton. The Committee enthusiastically endorses the Southern Division's program.

Special and improved properties for cotton are needed. Examples of these include weather, soil, chemical, heat, and abrasion resistance, improved luster, stretch, resilience, bulk, and flame resistance.

The Committee wishes to draw particular attention to the pressing need for flame-resistant finishes. A durable and low cost treatment is urgently needed for industrial, institutional, and apparel as well as military uses. This problem has become increasingly critical during recent years. The Southern Laboratory is recognized as the leading authority on flame proofing treatments and indeed has developed the most universally accepted finishes to date. The Committee urges immediate expansion of research on this problem.

The Committee recommends that emphasis be placed on research on the use of combination of physical and chemical phenomena for the development of yarn and fabric having new and useful properties.

The Committee recognizes the need for the development of multipurpose finishes for cotton. In the development of any specific finish, consideration should be given to the possibility of imparting additional properties simultaneously, especially if the additional property can improve the economic success of the finish.

F. Cottonseed

We recommend that all phases of work now underway and planned be continued and increased to adequate levels, pertaining especially to research on mycotoxins, cyclopropene fatty acids, new and improved food and feed products, and new and improved industrial products.

The hard seed-coat research should be given increased emphasis. Its development could possibly be a great deterrent in mold invasion of the cottonseed.

G. Mold Damage

Recognizing the serious problems which face the producer and processor of food and feed products caused by mold contamination, we cannot over-emphasize the importance of research in this field. We recommend that investigation go forward at full speed. Studies should be--if not already underway--started at the producer level, carried through harvesting-ginning and storage to mill processing.

We need to know at which level mold invasion begins and what steps might be taken to neutralize or inhibit their growth. In attacking this problem, the Department should use every means at its disposal. In addition to USDA research, the vast store of knowledge and facilities at universities, experiment stations, and private research institutions should be utilized through contract funds.

H. Cottonseed Meal

The recent announcement that the Southwest Poultry Experiment Station at Glendale, Arizona, will be closed is extremely disappointing. Producers of cottonseed meal have had high hopes for the success and confirmation of earlier findings. The possibility of obtaining greatly expanded markets for cottonseed meal must not be lost. Therefore, we request that this Station be allowed to operate until the iron supplementation studies underway in cooperation with the University of Arizona are completed.

MARKETING AND ECONOMIC RESEARCH

A major contribution to the industry in the area of pricing remains to be made. Because of technological developments in growing, harvesting, ginning, and processing, the system of pricing cotton in terms of grade and staple has become seriously impaired. No longer is grade and staple alone a reliable indication of spinning value. Through research in spinning, it has been shown that cottons assigned higher market values will indeed frequently perform less well in spinning and processing than cottons which were assigned lower prices. Under this system, those meaningful fiber properties that determine the spinning value of cotton are largely ignored. Realistic price differentials with respect to quality cannot be developed under this system and, unfortunately, they provide false guides to productive endeavor to all of those engaged in the cotton industry. In a free market system, price differentials guide production and quality improvement actions because the desires of the consumer are made known to the industry through the pricing mechanism. Unwanted qualities are priced cheaper while wanted qualities command premiums. The marketing and pricing of cotton must be improved if the industry is to survive.

Fiber properties closely correlated with spinning value of cotton are subject to measurement with instruments. Such factors as fiber fineness (maturity), strength, length, and color have been measured with instruments for a number of years. Attention has been given, and properly so, to increasing the speed with which these measurements can be made so that these methods can be utilized more effectively in the industry. Instruments to measure other important properties such as fiber length distribution, trash, elongation, and friction are needed. Rapid measurement of these fiber properties is a necessity if cotton is to be priced realistically in terms of spinning value.

The Committee urges that the following steps be taken without any further delay:

1. Support a maximum effort for the development of instruments to rapidly and accurately measure fiber and sample properties closely associated with ginning, marketing, spinning, and processing.
2. Introduce each of these instruments into classing offices as rapidly as they become available for field evaluation.
3. Initiate careful spinning studies to correlate fiber measurements made with these instruments with spinning values.
4. Initiate a pricing study to work out a method whereby cotton can be priced in terms of these fiber properties. Market price developed under this system should be a reliable guide to the industry in the area of quality improvement.

5. Support the development of an instrument that rapidly scans color of fiber and trash separately. This is highly important because it will have application in ginning, marketing, spinning, and processing. For example, it can be used in the gin to control the amount of cleaning in relation to fiber color. Separate measurement of these properties are important to pricing in the marketing system and in quality control during spinning and processing.

Molds that produce mycotoxin contamination in oilseeds and certain other commodities have been known to cause undesirable effects in certain animals. Therefore we urge that this problem be studied with reference to cottonseed with a view to developing a satisfactory method of assay, a rapid method of detecting contamination in individual lots of cottonseed, and to determine what can be done to minimize or eliminate this problem. It is anticipated that these efforts will be coordinated with efforts being made by others on the mold-mycotoxin problem.

The Committee recommends the continuation of studies dealing with the relationships of inherent and induced characteristics of raw cotton to manufacturing performance, costs, product quality, and end use value as an integral part of the Marketing Economics Division's research program.

It is further recommended that spinning test data accumulated and developed at the Clemson pilot plant be analyzed to determine to the fullest extent the relationship between measurable raw cotton quality factors and utility value. The results of these studies should be disseminated in the industry as rapidly as they become available.

The improvement of statistical data should be a continuing objective of the Department and the Committee recommends support of this work at an adequate level.

The importance of identifying areas of opportunity for expanded cotton use and areas where new problems may arise is recognized; therefore, the Committee recommends that consumer surveys be supported at not less than the current level.

The contribution of research by the Farmer Cooperative Service is of major significance in providing the guidelines for successful cooperative operation in the areas of purchasing, services, and marketing. The Committee recommends continued support of the research at present levels.



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REPORT AND RECOMMENDATIONS
of the
COTTON RESEARCH ADVISORY COMMITTEE
March 28-31, 1966
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Committee Membership:

- Mr. John M. Barrell, Assistant Vice President, Mount Vernon Mills, Inc.,
Baltimore, Maryland
- Mr. John P. Elting, Research Director, The Kendall Company, Charlotte,
North Carolina
- Mr. Jack Funk, Producer and Cotton Gin Operator, Harlingen, Texas
- Dr. Thomas W. Gilmore, Jr., Producer, Fern Crest Plantation, Sandersville,
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- Dr. Scott Hathorn, Jr., Agricultural Economist, J. G. Boswell Company,
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- Mr. Jack W. Kidd, President, Farmers and Ginners Cotton Oil Company
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- Dr. Harold D. Loden, General Manager, Paymaster Seed Farms, Plainview,
Texas
- Dr. Roy L. Lovvorn, Director of Research, Agricultural Experiment Station,
North Carolina State University, Raleigh, North Carolina
- Mr. Robert A. Montgomery, Secretary and Field Director, Staple Cotton
Cooperative Association, Greenwood, Mississippi

Additional copies of this report may be requested from Axel L. Andersen,
Executive Secretary, Cotton Research Advisory Committee, Research Program
Development and Evaluation Staff, U. S. Department of Agriculture,
Washington, D. C., 20250.

PREFACE

The second meeting of the Cotton Research Advisory Committee was held in Washington, D. C., on March 28-31, 1966. The meeting was attended by Mr. John M. Barrell, Mr. Jack Funk, Mr. Jack W. Kidd, Dr. Harold D. Loden, Mr. Robert A. Montgomery and Dr. Roy L. Lovvorn. Assistant Secretary George L. Mehren, Chairman, opened the meeting and Mr. Carl P. Heisig, Deputy Administrator, Economic Research Service, served as Vice-Chairman.

Industry statements on research needs were provided by the Texas Independent Ginners Association; Plains Cotton Growers, Inc.; National Cottonseed Products Association, Inc.; Texas Cotton Ginners Association and the American Seed Research Foundation. The American Phytopathological Society also submitted a statement.

The Committee made a systematic review of the Department's research program on cotton and cottonseed as contained in the February 1966 Progress Report on cotton and cottonseed research. This report was supplemented with discussions by the USDA staff members on current and projected programs in Farm Research, Consumer and Industrial Use Research, and on Marketing and Economic Research.

After careful review of the information available, and based upon current and future need for new knowledge and the seriousness of problems faced by the cotton industry, the Committee made the comments and recommendations included in this report to the Secretary of Agriculture.

COMMENTS AND RECOMMENDATIONS

GENERAL

Research and the Cotton Industry

The Committee recognizes the continuing and vigorous pursuit of research as the lifeblood of a strong and profitable cotton industry in this nation. It further recognizes in the USDA the one entity which--by virtue of representing the vast number of citizens engaged directly in or affected indirectly by the culture, handling, and processing of cotton and its products--can initiate, foster, and promulgate such research from the discovery of knowledge to the application of principle in agriculture, industry, and commerce.

The research methods and organization of the USDA are unique. There is no comparable system anywhere in the world. The results of this research have made it possible for our agriculture to feed and clothe millions in other lands. It is strongly recommended, therefore, that funds for agricultural research be increased--not decreased. The Committee also views with great alarm the reduction of Hatch Funds to land grant colleges as projected in the fiscal year 1967 budget. These funds should be increased rather than decreased.

Assistant Secretary for Science and Education

The Committee reaffirms its recommendation that an Assistant Secretary of Agriculture for Science and Education be established. The prestige of research on agricultural problems would be materially improved by the recognition accompanying an assistant secretaryship having responsibility in this area.

Instruments for Fiber Evaluation

We recommended last year in the section on fiber quality and marketing that special attention be given to the development of instruments to accurately determine the parameters which characterize the cotton fiber which, in various combinations, can be used to predict its behavior in spinning and in the spun yarn; and which, therefore, will come eventually to be accurate determinants of the value of the fiber. The Committee is disappointed with the progress to date, and urges that the Secretary take immediate steps to initiate this work which because of competitive relationships to cotton consumption is considered urgent.

Dissemination of Utilization Research Technology

The Committee commends and urges the maintenance at an accelerated rate of the work at the Southern Regional Laboratory on permanent-press and the other easy-care finishes to preserve and expand cotton's markets. In addition, it is of equal urgency that the laboratory pursue flame-proofing and retarding treatments incorporating durability and effectiveness, and

avoiding altering the desirable characteristics of cotton for such items as sheets, bedding, etc.

The Committee recommends an expanded extension program on cotton utilization research. New technology developed through research is ineffective without strong extension programs in cotton utilization.

Research on Bacterial Plant Pathogens

The Committee recommends the establishment of a pioneering research laboratory or other mission oriented research group for phytobacteriology in order that a sound research program can be initiated on bacterial pathogens and the cotton diseases they cause.

Research Planning

The Committee commends the Secretary in his attempt to develop a planning, programming and budgeting system for the Department of Agriculture.

The Committee is very pleased that a long-range study of agricultural research is underway as a joint study between the Department and the State agricultural experiment stations. Such a study should enable the Department and the Land Grant Colleges to do a far better job of developing their needs and of presenting them to the Congress and to the State legislatures.

Upgrading Personnel and Job Responsibilities

The Department is to be commended for its continued accomplishments in upgrading personnel and job responsibilities, particularly as reflected in a major shift in effort during the past few years from development and release of commercial varieties to the development of basic knowledge on the genetics, physiology, biochemistry and growth processes of the cotton plant which will be of immeasurably greater long-range value to the cotton industry. Continued reduction in number of professional employees conducting applied research with a shift to efforts in basic research is encouraged. The Committee urges, however, the removal of present policy of restrictive personnel ceilings. This policy discourages qualified people who might consider a career in the Department.

Research - Basic, Applied, Interdisciplinary

Although the Committee encourages a swing in emphasis from applied to basic research, it believes that all research on cotton should be balanced so that the whole spectrum of the cotton problem is considered at all times.

The interdisciplinary approach to basic research is recognized as having greater probability of providing solutions to important problems of long standing. Efforts to date by the Department are commended, and the continued expansion of interdisciplinary research efforts is recommended. The Department is also to be commended for its initial efforts in developing

interdisciplinary teams for developmental research to aid in bridging the gap between basic and applied research. The Committee suggests that such efforts to increase rate of application of knowledge developed in basic research be accelerated and at the same time cautions that developmental research efforts should not be the beginning of increased applied research by the Department.

Construction and Staffing New Laboratories

The Committee is gratified that funds were appropriated for construction of the Cotton Disease Laboratory at College Station, Texas, during fiscal year 1966. It is also pleased that plans are complete for physiology research laboratories at Stoneville, Mississippi, and Phoenix, Arizona, and that funds were appropriated for construction during fiscal year 1966. The Committee recommends that these laboratories be completely staffed during fiscal year 1968 with competent staff for full utilization of these laboratories as soon as construction is completed.

Interagency and Industry Cooperation

The Committee would like to express its appreciation to the Department for the cooperative efforts and for the excellent work accomplished by the various research agencies within the Department. We would strongly urge that closer coordination be achieved, that research projects be terminated or revised as progress is made and that every effort be made to achieve the greatest efficiency in the spending of research funds by shifting funds among projects and agencies as necessary.

The Committee also commends the Department for and is appreciative of its close working relationship with the commercial cotton breeding industry, which has resulted in and will continue to serve the best interests of the cotton industry.

FARM RESEARCH

Obtaining Uniform Stands

The Department is to be commended for its fundamental research program which has contributed much to the knowledge of factors which influence seed germination, seedling emergence, and early season seedling growth. The continuation of this research is essential for further reduction of production costs.

A multidisciplinary applied research program should be developed to demonstrate application of basic knowledge in obtaining uniform stands of vigorous seedlings.

Environment and Plant Development

The development of fundamental knowledge in the fields of plant physiology and related disciplines is essential for understanding the relationships

of the cotton plant to its environment. This relationship is of great importance in obtaining maximum yields of quality fibers at the lowest possible cost. Expansion of the knowledge of environmental factors which influence the growth and fruitfulness of the cotton plant must continue.

Defoliation

The Committee recognizes the importance of proper removal of leaves from the cotton plant prior to mechanical harvest and takes particular recognition of contributions of defoliation research to cotton quality and subsequent potentials for cost reduction in ginning and processing. It recognizes, however, that present defoliation and dessication practices do not generally and adequately accomplish desired results. The Committee is encouraged with progress made in low volume application of defoliants and dessicants and suggests that work in this area be completed with recommendations being made for farm application of this practice. The Committee has particularly recognized the relationships of defoliation on fiber quality with mechanical harvest, high speed ginning, and greatly increased processing rates in the mills and suggests that defoliation research should give more attention to the interaction of defoliation and fiber quality. The Committee suggests that the eventual solution to the major problems in defoliation is dependent upon basic research now being conducted and suggests that work on the physiology of defoliation be continued on both an intramural and extramural basis. The Committee commends USDA for its research efforts carried out in cooperation with industry groups and recommends that they be continued and expanded.

Fiber Development

The Committee was impressed with the basic research on fiber development which was reported by the Southern Utilization Research and Development Division. It is believed that such research may have implications on production of higher quality fiber and the Committee suggests that a closer working relationship between SURDD and the physiology research being conducted in other divisions of ARS would be of benefit in developing basic knowledge of fiber development.

Use of Historical Weather Records

Computerized weather records have been demonstrated to be of value in making planting date decisions at a number of locations within the Cotton Belt. The Committee suggests that efforts to apply these principles may serve as an aid in cost reduction and suggests that efforts to determine applicability of this type data in other regions of the Belt could be advantageous in further cost reductions. The feasibility of using historical weather data for harvesting date decisions should also be explored.

Weed Control

Excellent progress has been made in developing efficient weed control practices. The cooperative Federal-State research effort is the heart of this accomplishment. The Department is to be commended for its leadership

in helping to maintain superior working relationships with the States and with industry.

Expensive weed control problems still exist for the cotton producer; therefore, there must be no reduction in the weed research effort. To strengthen the weed research effort the Committee recommends that attention be given to the following remarks and suggestions:

1. That a weed research position be established at the Cotton Laboratory to be constructed at College Station, Texas.
2. New and exciting developments in the field of plant physiology resulting in a better understanding of the processes of growth seem to offer possibilities for weed control which could greatly reduce the use of chemicals. Interdisciplinary research in this field appears to offer splendid opportunities for accomplishment and should be encouraged.
3. Research on the effectiveness of new chemicals for weed control and their fate in cotton products and soils should continue to receive major attention. Work underway on screening new materials and the influence of chemical structure on herbicidal properties should be continued.
4. Perennial weeds are still a serious problem in cotton. This is especially true for nutsedge. It is recommended that work on these perennial weeds be intensified, even at the expense, if necessary, of other aspects of the weed research program.

Insect Control

The Department is to be commended for its vigorous and imaginative research on the boll weevil. This work should be supported to the fullest possible extent. There are, however, a number of major cotton insect pests which have received too little attention. Boll worms, plant bugs, and spider mites take a heavy toll in reducing cotton yields and are expensive to control. Resistance to insecticides in these pests and others indicates the need for an aggressive research program to find means of control other than insecticides.

The presence of the boll weevil and pink boll worm in Arizona and California presents some additional problems to the cotton industry and justify the establishment of a regional cotton insect laboratory in the irrigated Southwest.

The identification and the synthesis of the sex lure in pink boll worm opens up an exciting possibility for the control of this insect. Special emphasis should be given to research which will show the way to use this new device in control.

Insect resistance to insecticides and human health hazards from chemical residues demand new approaches to the control of insect pests. Entomological research in the Department and at the State experiment stations indicates that there are other ways of reducing insect populations. There is substantial evidence that, in the very near future, pest populations will be managed through the intelligent use of predators, parasites, disease organisms, attractants, repellants, and other agents. In order to apply the knowledge we now have of these agents, it is quite clear that research must be accelerated in the following areas: chemistry of attractants and stimulants; screening for chemosterilants; field use of insect viruses; and biology of predators and parasites.

The relationship between feeding habits of cotton insects and glandless cotton is not clear in the minds of cotton researchers. The Committee is concerned about the lack of research to answer the problem of insect preference for glandless cotton strains and suggests that this problem must be answered or it may serve as a deterrent to efforts of cotton breeders in the release of glandless varieties for commercial use.

Disease Control

Verticillium wilt is recognized as becoming an increasing factor in production costs in large and productive areas of the Cotton Belt. The Committee suggests that a well planned, comprehensive and continuing interdisciplinary attack on this problem is of utmost importance. The problem is very complex and eventual solution of this problem in development of resistant varieties lies in accumulation of basic knowledge on the biochemistry of the host-parasite relationship. The Committee suggests the cost reduction aspects of Verticillium wilt are adequate to justify expanded research in this area.

Breeding and Variety Evaluation

The Committee is gratified at the progress made in development of basic glandless seed stocks. The development and eventual release of glandless varieties will be advantageous in aiding in cost reductions and improvement of the competitive position of cotton seed products.

The National Cotton Variety Testing Program has resulted in development of information on response of varietal types which is of increasing value to scientists in the fields of genetics, physiology and plant breeding in developing a broader understanding of the variety-environment relationships. Application of knowledge obtained from these studies will be advantageous to the cotton industry in production of higher quality fiber and could improve the overall competitive position of cotton. This program should be continued. The Committee was impressed with the quality tests which are conducted on a regional basis as a part of the National Cotton Variety Testing Program and recognizes that such efforts can result in the identification of breeding materials which could greatly improve the quality of cotton produced in all areas of the Cotton Belt. This program should be continued and expanded whenever feasible.

Because mold invasion has become a problem facing the producer and processor of food and feed products, the Committee recommends that greater emphasis be placed on the development of basic breeding materials with impermeable seed coats. Such a development could possibly be a great deterrent in mold invasion of cottonseed. Information is needed on the inheritance of impermeable seed coats and on methods of transfer of this character in breeding programs.

Soil Tillage

The Committee was impressed with the progress made in precision tillage research at Shafter, California and suggests that similar research is urgently needed in the other major cotton production areas. Problems with poor taproot development and consequently severe limitations of yield potential are appearing with increasing frequency in other areas of the Cotton Belt as a result of mechanization and supplemental irrigation.

Fertilizers

The Committee noted an absence of reference to fertilizer response in the Department's presentations and suggest that ARS review the fertilizer research being conducted by the Department and State experiment stations to determine if adequate attention is being given to the fertilizer relationships of cotton production in view of present production technology.

Mechanization

The cost of controlling weeds and grass continues to be a major cost in the production of cotton. Various research projects carried on in chemical weed control should include, in addition to research on better chemicals, investigations on improved methods of incorporating chemicals into the soil.

Research on safe methods of low volume application of concentrated agricultural chemicals, such as insecticides and defoliants, should be expanded and explored to its fullest extent because of the cost reductions made possible by their application. Additional research is needed to improve and to develop efficient and safe equipment for applying concentrated insecticides, both from aerial and ground equipment.

Mechanical harvesting continues to show considerable field loss. If this loss could be eliminated, considerable saving in the cost of production would be realized. Improving the performance of mechanical pickers should be carried out in every phase possible.

Ginning

The Committee recognizes the need of improvement in baling or packaging cotton in the ginning operation. The possibility of reducing total direct cost two cents per pound in packaging costs, warehousing and transportation costs, and initial mill receiving and opening room costs by changing packaging methods should be explored to its fullest extent.

The Committee recommends that the Department lend support where needed in further refinement of the automatic cotton sampler and encourage its widespread use in the ginning industry.

The Committee recommends a cooperative research program between the Standards and Testing Branch, Consumer and Marketing Service, the Commodity Credit Corporation, and appropriate research divisions, whereby bale evaluations are made on both automatically drawn and conventionally drawn cotton samples with the view of determining savings from the use of automatic samplers to Commodity Credit Corporation in its price support program and its influence on grower income.

Power requirements continue to be a major expense in the ginning operation. Efforts to reduce this cost should be redoubled with emphasis being put on unloading of cotton from the trailer. New methods of conveying cotton in the gin plant should be explored to its fullest extent.

Harvesting practices used by the producer makes it necessary that better methods be employed to handle or collect the large amount of trash carried to the gin with the seed cotton. To prevent health departments from taking drastic action against the ginning industry, it is recommended that research on air pollution control and trash disposal at ginning plants be increased.

The Committee requests that the Department review information available concerning central ginning with the objective of making the information available to the entire cotton ginning industry.

UTILIZATION RESEARCH

Development of Products with Consumer Appeal

The Committee recognizes that production research has led to the reduction of the cost of cotton so that it is now the least expensive, versatile, textile fiber available to the weaver. We are, however, faced with the past loss of substantial segments of the market and with the imminent loss of a major portion of the remaining cotton market. The Committee recommends that a highly intensified effort be directed to the development of products with consumer appeal and at the same time continue work at its present rate on basic and exploratory research projects.

Disseminate Research Results to Manufacturer and Consumer

Although recognizing results of utilization research are published promptly in scientific journals, a greatly increased effort is needed to disseminate research to manufacturers and consumers so that practical end use production will be commercialized.

The Committee feels that both of the above recommendations should be activated as integral parts of a single coordinated effort directed toward a substantial increase in the use of cotton.

Cotton Products with Special Properties

Research on the development of cotton products with special properties will provide the cotton industry with new markets and outlets, thus assuring increased utilization for cotton. The Committee enthusiastically endorses the Southern Utilization Research Division's research program in this area.

Specifically, the Committee recommends the following actions be taken:

1. Intensify research on the use of combinations of physical and chemical phenomena for the development of yarn and fabrics having new and useful properties desired by the consumer.
2. Intensify investigations on the effects of substituent groups in cotton on the physical properties such as flexibility, tensile strength, extensibility, toughness and related properties.
3. Maintain at the current high rate of effort, both the basic and applied research to develop abrasion-resistant, durable-press goods.
4. Emphasize research on special and improved properties for cotton such as weather, heat, chemical and abrasion resistance; improved bulk and lower cost; and on non-yellowing flame retardants.
5. Continue research to emphasize the relationship of fiber physical properties and morphology with changes caused by chemical processes in order to provide sound basic information on the development of new or improved cotton products.
6. Expand research on the effect of cotton fiber property and processing machinery variables on productivity in spinning. Basic information of the interrelationship of fiber properties and processing variables and their influence on processing efficiency is needed by the cotton textile industry.
7. New and improved consumer products to meet specific needs offer a sure way of increasing the consumption of cotton. It is recommended that research to develop basic information on yarn and fabric structures and properties that can be used to develop new cotton products competitive with products of manmade fibers and nontextile materials be expanded and assigned high priority.
8. The Committee commends the shift in emphasis on machinery research from the development of processing machines to the seeking of basic information that will lead to radically new methods and equipment for processing cotton into high quality,

low cost products. It is recommended that this effort be continued and that the recent breakthrough of electrostatic processing be exploited to the fullest.

Cyclopropene Fatty Acids

The Committee recommends work be continued at a level necessary to bring to a conclusion and solve the cyclopropene fatty acid problem in cottonseed and cottonseed meal. We feel this work has been progressing satisfactorily. The development of a method for inactivating cyclopropene in cottonseed meal could be of great value to the industry.

Mycotoxin Research

This Committee feels it should repeat and reemphasize recognition of the serious problems which face the producer and processor of food and feed products caused by mold contamination and recommends that investigations on this problem receive high priority and that research go forward at full speed. Research on methodology has progressed satisfactorily, and the seed and meal mold damage survey has provided excellent information. Perhaps funds used on this survey could be better utilized on other phases of mold research.

The Committee also recommends that all levels of research on molds be maintained and/or implemented and that greatly increased research activity be instigated at the producer or field level since evidence points to seed invasion by molds at this stage.

The Committee recommends that work continue at a high level on the inactivation of mold toxins in seed and meal. This we feel might become a vital phase of this problem.

Gossypol Neutralization

The inactivation or neutralization of gossypol by use of iron and possibly other metal salts shows great promise. This research should be continued.

Industrial Use of Protein Isolates

The Committee is of the opinion that a potentially large and profitable market exists for the use of protein isolates from cottonseed meal. There is a vast industrial market for these isolates and we recommend increased emphasis and research in this direction. Also there are potential uses for protein isolates in the manufacture of good high quality foods. Work presently under way should be implemented and new research projects instigated both for food and industrial uses. The Committee feels that emphasis should be on industrial use since industrial use markets at this time appear to be much larger.

MARKETING AND ECONOMIC RESEARCH

Pricing of Raw Cotton

One of the major problems facing the cotton industry today is the matter of pricing of raw cotton. The Committee, as in previous years, remains concerned that the Department does not fully appreciate the importance of has not found ways of moving rapidly to bring together resources for colutions or improvement or has failed to recognize that research alone will not effect a solution to the problem of pricing raw cotton.

The Committee recommends that a committee be established within the Department empowered to:

1. Set forth objectives, goals, and timetables concerning the problems on pricing of raw cotton.
2. Define specific courses of action for the agencies concerned for achievement of the objectives.
3. Provide reports of accomplishments at proper intervals and establish new guidelines for continuing progress.

Research to Improve Marketing

The Committee recognizes that USDA price support programs are a dominant factor in cotton marketing today. It believes that the Department must exercise responsibility for bringing new technology and new knowledge into the marketing system to make it capable of functioning as a vital part of a dynamic industry. Currently, the marketing system is a deterrent to introduction of new technology into the industry from both the production and mill utilization standpoints.

Marketing Standards

The Department is charged with responsibility for developing and maintaining standards on which raw cotton are traded. These standards, through price support action of the Department, are guiding much research activity of the Department, as well as State and private agencies, and are guiding production practices and ginning practices of cotton growers while Department research has proven these standards are inadequate.

Fiber Evaluation and Instrumentation

This Committee recommends that research accomplishments in the field of fiber or quality evaluation be fitted into the cotton marketing system with research projects of the scope and breadth that may be necessary to insure that the benefits of such work accrue to the entire industry. This applies to technology and information currently available as well as to future developments.

A program to evaluate currently available fiber length instruments, and color instruments along with presently used fiber fineness instruments in the marketing system is presently feasible. The cost of such a program could be offset by reduced losses of Commodity Credit Corporation in its price support programs. The Committee recommends a cooperative research, testing and marketing program with the Market Quality Research Division, Agricultural Research Service; Marketing Economics and Economic and Statistical Analysis Divisions, Economic Research Service; Cotton Division, Consumer and Marketing Service; and the Commodity Credit Corporation, as cooperators to test, catalog and offer for sale Commodity Credit Corporation owned stocks of cotton to domestic and foreign mills willing to cooperate in such a program. This program would necessarily involve as much as 200,000 bales of cotton to provide volume for mill evaluation.

A pilot program, incorporating fibrograph length measurements, colorimeter measurements along with micronaire, grade and staple evaluation should be initiated at one of the Department's classing offices for the 1966 crop.

The marketing and pricing of cotton must be improved if the industry is to become a growing and dynamic segment of the economy.

The Committee reiterates the following specific recommendations as outlined in its 1965 report even though some action has been taken by the USDA:

1. Support a maximum effort for the development of instruments to rapidly and accurately measure fiber and sample properties closely associated with ginning, marketing, spinning, and processing.
2. Introduce each of these instruments into classing offices as rapidly as they become available for field evaluation.
3. Initiate careful spinning studies to correlate fiber measurements made with these instruments with spinning values.
4. Initiate a pricing study to work out a method whereby cotton can be priced in terms of these fiber properties. Market price developed under this system should be a reliable guide to the industry in the area of quality improvement.
5. Support the development of an instrument that rapidly scans color of fiber and trash separately. This is highly important because it will have application in ginning, marketing, spinning, and processing. For example, it can be used in the gin to control the amount of cleaning in relation to fiber color. Separate measurement of these properties are important to pricing in the marketing system and in quality control during spinning and processing.

Effect of Sales Policies

Studies should be initiated, with cotton industry organizations cooperating, of sales policies of manufacturers of competing fibers with a view to determining (1) the effect of such policies upon the consumption of cotton, (2) their effect on end product quality from the consumer's viewpoint, and (3) the effect on consumer prices. The purpose would be to better define the sales procedures which will improve the competitive position of cotton.

Improving Market Statistics

The Department should periodically review market news reporting and statistical information assimilation with a view to making this information more nearly reflect market prices. Adequate support should be given to this work.

Cotton Characteristics and Market Performance

The Committee recommends the continuation of studies dealing with the relationships of inherent and induced characteristics of raw cotton to manufacturing performance, costs, product quality, and end use value as an integral part of the Marketing Economics Division's research program.

Cooperative Marketing Research

The contribution of research by the Farmer Cooperative Service is of major significance in providing the guidelines for successful cooperative operation in the areas of purchasing, services, and marketing. The Committee recommends continued support of the research at present levels.

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UNITED STATES DEPARTMENT OF AGRICULTURE
Research Program Development and Evaluation Staff
Washington, D. C.

R REPORT AND RECOMMENDATIONS
of the
COTTON RESEARCH ADVISORY COMMITTEE
Developed at its Meeting ^{the third} [3rd]
March 13-16, 1967
Starkville, Stoneville, Mississippi X

Committee Membership:

- Mr. Richard L. Abbott, National Retail Merchandise Manager, Montgomery Ward & Company, Chicago, Illinois
Mr. John M. Barrell, Assistant Vice President, Mount Vernon Mills, Inc., Baltimore, Maryland
Mr. John P. Elting, Research Director, The Kendall Company, Charlotte, North Carolina
Mr. Jack Funk, Producer and Cotton Gin Operator, Harlingen, Texas
Dr. Thomas W. Gilmore, Jr., Producer, Fern Crest Plantation, Sandersville, Georgia
Dr. Scott Hathorn, Jr., Agricultural Economist, J. G. Boswell Company, Corcoran, California
Mr. Jack W. Kidd, President, Farmers & Ginners Cotton Oil Company, Birmingham, Alabama
Dr. Harold D. Loden, General Manager, Paymaster Seeds, Abilene, Texas
Dr. Roy L. Lovvorn, Director of Research, School of Agriculture and Life Sciences, North Carolina State University, Raleigh, North Carolina
Mr. Robert A. Montgomery, Secretary and Field Director, Staple Cotton Cooperative Association, Greenwood, Mississippi

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Additional copies of this report may be requested from Axel L. Andersen, Executive Secretary, Cotton Research Advisory Committee, Research Program Development and Evaluation Staff, U. S. Department of Agriculture, Washington, D. C. 20250.

PREFACE

The third meeting of the Cotton Research Advisory Committee was held at Mississippi State University, Starkville, and the Delta Branch Experiment Station, Stoneville, Mississippi, March 13-16, 1967. Mr. Abbott, Mr. Funk, Dr. Gilmore, and Mr Kidd were unable to attend the meeting. Carl P. Heisig, Deputy Administrator, Economic Research Service, served as chairman for the meeting. President W. L. Giles and members of his staff from Mississippi State University participated in the meeting as did W. D. Maclay, Director, Research Program Development and Evaluation Staff and Louis Hawkins, Director at Large, Southern Agricultural Experiment Station Directors.

Industry statements were provided by the National Cotton Council of America, the Cotton Research Committee of Texas, and the American Seed Research Association.

The Committee made a systematic review of the Department's research program on cotton and cottonseed as contained in the February 1967 Progress Report on cotton and cottonseed research. This report was supplemented with discussions by the USDA staff members on current and projected programs in Farm Research, Consumer and Industrial Use Research, and on Marketing and Economic Research.

After careful review of the information available, and based upon current and future need for new knowledge and the seriousness of problems faced by the cotton industry, the Committee made the comments and recommendations included in this report to the Secretary of Agriculture.

COMMENTS AND RECOMMENDATIONS

GENERAL

Research and the Cotton Industry

The Committee recognizes the continuing and vigorous pursuit of research as the lifeblood of a strong and profitable cotton industry in this nation. It further recognizes the Agricultural Research System in the United States is the one entity which--by virtue of representing the vast number of citizens engaged in or affected by the culture, handling, and processing of cotton and its products--can initiate, foster, and promulgate such research from the discovery of knowledge to the application of principle in agriculture, industry, and commerce.

The research methods and organization of the United States Department of Agriculture and the State Agricultural Experiment Stations are unique. There is no comparable system anywhere in the world. The results of this research have made it possible for our agriculture to feed and clothe millions in other lands. It is strongly recommended, therefore, that funds for agricultural research be increased--not decreased--if we are to maintain or improve our present standard of living.

Assistant Secretary for Science and Education

The Committee reaffirms its recommendation that an Assistant Secretary of Agriculture for Science and Education be established. The prestige of research on agricultural problems would be materially improved by the recognition accompanying an assistant secretaryship having responsibility in this area.

Plant Disease Isolation Research Facility

The Committee recommends the establishment of a Plant Disease Isolation Research Facility which would permit research on plant diseases and pests that could not otherwise be studied without danger of escape that would lead to serious consequences.

Research on Bacterial Plant Pathogens

The Committee recommends the establishment of a pioneering research laboratory or other basic research group for phytobacteriology in order that a sound research program can be initiated on bacterial pathogens and the diseases they cause.

Future Needs for Specific Fiber Types for Specific End Uses

In view of the rapidly changing demands for consumer and industrial cotton products; which in turn change fiber requirements, and the necessary long time required for the production of new types of cotton fiber, the Committee recommends that an exploratory survey be initiated immediately designed to provide dependable projections for the demand for cotton fiber in each major category.

Short-Staple Research

More than one-fourth of the cotton produced in the United States is of relatively short staple length (31/32 inch or less). The percentage of the U. S. cotton crop of this staple length has remained at about the same level even though the percentage take-off of such staple has been reduced. Because of environmental and climatic limitations of major cotton production areas the Committee recognizes that the production of short-staple cotton will continue to be a fact, and therefore of increasing importance to the total cotton industry, particularly in view of present high take-off of longer staples. The Committee urges expanded research in the areas of cost reduction, quality improvement and increased utilization of 1-inch and shorter cotton.

Instruments for Fiber Evaluation

The Committee is pleased to note that contracts have been issued for the development of instruments to accurately determine the parameters which characterize the cotton fiber which, in various combinations, can be used to predict its behavior in spinning and in the spun yarn; and which, therefore, will come eventually to be accurate determinants of the value of the fiber.

Research Planning

The Committee commends the Secretary in development of a planning, programming and budgeting system for the Department of Agriculture and for developing an information and retrieval system for current agricultural research programs. The Committee is also pleased that the long range study of agricultural research conducted by the USDA and the State Agricultural Experiment Stations has been completed and has resulted in the development of the report "A National Program of Research for Agriculture." The Committee concurs in the recommendations contained in this report; however, it would recommend the report be used in the establishment of guidelines for future research and not to establish ceilings for any particular type of research on any commodity.

The Department is complimented for the establishment of the Cotton Research Task Force and it is anticipated that the report of this group will serve to define and categorize the specific research requirements for cotton.

Upgrading Personnel and Job Responsibilities

The Department is to be commended for its continued accomplishments in upgrading personnel and job responsibilities, particularly as reflected in a major shift in effort during the past few years from development and release of commercial varieties to the development of basic knowledge on the genetics, physiology, biochemistry and growth processes of the cotton plant which will be of greater long-range value to the cotton industry. Continued reduction in number of professional employees conducting applied research with a shift to efforts in basic research is encouraged. The Committee urges, however, that the restrictions on travel of scientific personnel be eased in order to maintain professional proficiency.

Technical Assistance for Professional Positions

It was apparent to the Committee that many professional positions in the on going program are not adequately supported for efficient research productivity. This is especially true for positions of long standing. It is recommended that additional funds be made available to adequately support all current professional positions.

Construction and Staffing New Laboratories

The Committee expressed in its report last year gratitude that funds were appropriated during fiscal year 1966 for construction of laboratories approved for cost reduction research. The Committee expresses its disappointment that construction of these laboratories has not been initiated and furthermore urges that construction be started at the earliest possible date. Staffing of these laboratories should be completed in an orderly manner as rapidly as personnel are available.

FARM RESEARCH

Obtaining Uniform Stands

The Department is to be commended for its fundamental research program which has contributed much to the knowledge of factors which influence seed germination, seedling emergence, and early season seedling growth. The continuation of this research is essential for further reduction of production costs.

Basic Research in Cotton Physiology

Growth, development, and fruiting in the cotton plant are dependent upon complex physiological processes which in turn are influenced by genotype, environment, insects, diseases, and other factors. A better understanding of the basic internal plant processes and their interaction with other factors is needed to develop applied methods which will lead to more effective control over growth and fruiting in the cotton plant. These relationships are of great importance in obtaining maximum yields of quality fiber at the lowest possible costs. Expansion of the knowledge in these areas which influence the growth, fruitfulness, and productivity of the cotton plant must continue.

It is urged that staffing of the Cotton Physiology Laboratories at Stoneville, Mississippi, and Phoenix, Arizona, proceed in an orderly manner, as rapidly as personnel are available.

Breeding and Variety Evaluation

The Committee is gratified at the progress made in development of basic glandless seed stocks. The development and eventual release of glandless varieties will be advantageous in aiding in cost reductions and improvement of the competitive position of cottonseed products.

The National Cotton Variety Testing Program has resulted in development of information on response of varietal types which is of increasing value to scientists in the fields of genetics, physiology and plant breeding in developing a broader understanding of the variety-environment relationships. Applications of knowledge obtained from these studies will be advantageous to the cotton industry in production of higher quality fiber and could improve the overall competitive position of cotton. This program should be continued.

The Committee was favorably impressed with the High Quality Tests conducted on a regional basis as part of the National Cotton Variety Testing Program and was pleased to see that this has been expanded to cover the High Plains area. The Committee recognizes that such efforts can result in the identification of breeding materials and strains having superior fiber properties which could greatly improve the quality of cotton produced in all areas of the Cotton Belt. This program should be continued and expanded whenever possible.

The Committee urges expanded research in genetics, physiology and related disciplines to develop basic seed stocks with higher quality potentials adapted to the traditional "short-staple" production areas.

Disease Control

Cotton diseases, especially seedling diseases, verticillium wilt and boll rots, continue to cause serious production losses. Basic research on the biology of the causal organisms, the nature of resistance, host-parasite relations, and the genetics of resistance are essential to the development of practical methods for reducing losses due to diseases.

The Committee urges that research in this area be advanced as rapidly as possible and that the Cotton Pathology Laboratory at College Station, Texas, be completely staffed in an orderly manner as rapidly as personnel are available.

Nematode Control

Nematology research should be expanded using an interdisciplinary approach to controlling nematodes, weeds, and pathogenic soil fungi in order to reduce unit production cost by use of wide spectrum biocides and combinations of specific pesticides. All three pests must be effectively controlled in many cotton-producing areas to obtain high production at low cost. Control of one pest without simultaneous control of other pests does not insure optimum production and may increase other undesirable organisms.

Initiation of research is recommended on the development of chemical and cultural control measures for the sting nematode. Research should include screening of cotton germ plasm to locate possible sources of genetic resistance.

Weed Control

Excellent progress has been made in developing efficient weed control practices. The cooperative Federal-State research effort is the heart of this accomplishment. The Department is to be commended for its leadership in helping to maintain superior working relationships with the States and with industry. Expensive weed control problems still exist for the cotton producer; therefore, weed research must be intensified. To strengthen the weed research effort the Committee recommends the following:

1. Initiate and intensify fundamental research in absorption and translocation of herbicides in hard-to-kill weeds. The establishment of a weed research (plant physiologist) position at College Station, Texas, would materially help this research.
2. Expand research to investigate the interaction of herbicides used in combination with other herbicides and with other pesticides. The addition of a plant physiologist at Phoenix, Arizona, to conduct research in this area is recommended.
3. New and exciting developments in the field of plant physiology resulting in a better understanding of the processes of germination and growth seem to offer possibilities for weed control which could greatly reduce the use of chemicals. Expansion of interdisciplinary research in this field offers splendid opportunities for accomplishment and is highly recommended.
4. Research on the effectiveness of new chemicals for weed control and their fate in cotton products and soils must continue to receive major attention. Work underway on screening new materials and the influence of chemical structure on herbicidal properties must be continued.
5. Perennial weeds are still a serious problem in cotton. It is recommended that work on these perennial weeds be intensified, even at the expense, if necessary, of other aspects of the weed research program.
6. The need to determine and influence the metabolism and fate of herbicides in plants, soil, and water is urgent. We urge that staffing of weed science research positions in the new laboratory at Stoneville, Mississippi, proceed in an orderly fashion as fast as qualified scientists are available.

Insect Control

The Department is to be commended for its vigorous and imaginative research on the boll weevil. This work should be supported to the fullest possible extent. There are several major cotton insect pests which have received too little attention. Bollworms, plant bugs, and spider mites take a heavy toll in reducing cotton yields and are expensive to control. Resistance of these pests to insecticides indicates the need for an aggressive research program to find means of control other than insecticides.

The research on control and potential eradication of the boll weevil conducted by the Boll Weevil Research Laboratory has been outstanding. Research findings indicate that these new approaches to boll weevil control may be used to eliminate the pest. The limited infestation of boll weevil on the Texas High Plains has been halted by the insecticide program carried on for the past three years by public agencies. It is strongly recommended that all the new promising techniques, including the use of sterile insects, baits, and systemic insecticides be tested in the area. The purpose of this program, other than the possible eradication of the boll weevil from the area, is to adequately field test newly developed techniques in boll weevil control and eradication on a Pilot Plant scale.

The recent spread of the pink bollworm in Arizona, California and Nevada places an immediate and pressing need for the Cotton Insect Laboratory at Phoenix, Arizona. The Committee urges that this laboratory be staffed as soon as construction is completed and that initial emphasis be on the pink bollworm.

The identification and the synthesis of the sex lure in pink bollworm opens up an exciting possibility for the control of this insect. Special emphasis should be given to research which will show the way to use this new device in control.

Insect resistance to insecticides and human health hazards from chemical residues demand new approaches to the control of insect pests. Entomological research in the Department and at the State experiment stations indicates that there are other ways of reducing insect populations. There is substantial evidence that, in the very near future, pest populations will be managed through the intelligent use of predators, parasites, disease organisms, attractants, repellants, and other agents. In order to apply the knowledge we now have of these agents, it is quite clear that research must be accelerated in the following areas: chemistry of attractants and stimulants; screening for chemosterilants; field use of insect viruses; and biology of predators and parasites.

Heleothis species are pests of a number of crops and are a particularly wide spread insect on cotton. An in-depth study of the Heliothis complex is needed with research directed toward population control over defined areas.

The relationship between feeding habits of cotton insects and glandless cotton is not clear in the minds of cotton researchers. The Committee is concerned about the lack of research to answer the problem of insect preference for glandless cotton strains and suggests that this problem must be answered or it may serve as a deterrent to efforts of cotton breeders in the release of glandless varieties for commercial use. Research should be accelerated in this area.

Fertilization

The Committee noted an absence of reference to fertilizer response in the research presentations and suggests that the Cotton Task Force review the fertilizer research being conducted to determine if adequate attention is being given to fertilizer relationships in cotton production in view of present production technology.

Weather Records and Planting Date Decisions

Computerized weather records in the High Plain of Texas have been demonstrated to be of value in making planting date decisions. The Committee suggests that efforts to apply these principles may serve as an aid in cost reduction and suggests that efforts to determine applicability of this type of data in other regions of the Belt could be advantageous in further cost reductions. The feasibility of using historical weather data for harvesting date decisions should also be explored.

Defoliation

The Committee recognizes the importance of proper removal of leaves from the cotton plant prior to mechanical harvest and takes particular recognition of contributions of defoliation research to improved cotton quality and subsequent potentials for cost reduction in ginning and processing. It recognizes, however, that present defoliation and dessication practices do not generally and adequately accomplish desired results. The Committee is encouraged with progress made in low volume application of defoliants and dessicants and urges that work in this area be brought to fruition with recommendations being made for farm application as results become available. The Committee has particularly recognized the relationships of defoliation on fiber quality with mechanical harvest, high speed ginning, and greatly increased processing rates in the mills and suggests that defoliation research should give more attention to the interaction of defoliation and fiber quality. The Committee suggests that the eventual solution to the major problems in defoliation is dependent upon basic research now being conducted and urges that work on the physiology of defoliation be continued on both an intramural and extramural basis. The Committee commends USDA for its research efforts carried out in cooperation with industry groups and recommends that they be continued and expanded.

Mechanization

The cost of controlling weeds and grass continues to be a major cost in the production of cotton. Various research projects carried on in chemical weed control should include, in addition to research on better chemicals, investigations on improved methods of application, placement and incorporation of chemicals into the soil.

Research on safe methods of low volume application of concentrated agricultural chemicals, such as insecticides and defoliants, should be expanded and explored to its fullest extent because of the cost reductions made possible by their application. Additional research is needed to improve and to develop efficient and safe equipment for applying concentrated insecticides, both from aerial and ground equipment.

Mechanical harvesting continues to show considerable field loss. If this loss could be eliminated, considerable saving in the cost of production would be realized. Research to improve the performance of mechanical pickers should be increased and carried out in every phase possible.

Systems Approach to Production Operations

The Committee recommends that work be intensified on the integration of cultural operations such as seed bed preparation, bed sloping, planting and pesticide application with complete systems of production involving fewer operations and interchangeable components of equipment.

Automated Seed Cotton Handling

The handling of seed cotton from the mechanical harvester to the gin is a major cost area. Research should be expanded on reducing the bulk and improving the handling characteristics of seed cotton toward the ultimate development of more efficient, highly mechanized systems of field handling, temporary storage, and transport to the gin. This work should be coordinated with research on handling seed cotton at the gin.

Cotton Planting Seed Quality

The mechanization of cotton harvesting and high speed ginning has resulted in creation of new problems in obtaining quality cotton planting seed. Research is urged in the areas reducing damage during harvest and ginning and of cottonseed storage and new processing techniques which will result in higher quality planting seed and resultant vigorous, healthy stands.

Ginning Research

The Committee recognizes the need of improvement in baling or packaging cotton in the ginning operation. The possibility of reducing total direct cost two cents per pound in packaging costs, warehousing and transportation costs, and initial mill receiving and opening room costs by changing packaging methods should be explored to its fullest extent.

The Committee recommends that the Department lend support where needed in further refinement of the automatic cotton sampler and encourage its widespread use in the ginning industry.

The Committee again recommends a cooperative research program between the Standards and Testing Branch, Consumer and Marketing Service, the Commodity Credit Corporation, and appropriate research divisions, whereby bale evaluations are made on both automatically drawn and conventionally drawn cotton samplers to Commodity Credit Corporation in its price support program and its influence on grower income.

Power requirements continue to be a major expense in the ginning operation. Efforts to reduce this cost should be redoubled with emphasis on unloading of cotton from the trailer. New methods of conveying cotton in the gin plant should be explored to its fullest extent.

Air Pollution Control at Ginning Plants

The problems of trash handling, collection and disposal are increased with the mechanization of cotton harvesting. The passage recently of the "Clean Air and Water Act" by the Congress requires that these problems receive increased emphasis. The various states have, or shortly will pass, laws dealing with air pollution. Sufficient technical information is not available to provide guidance in (1) setting up realistic standards for cotton gins and (2) designing systems for use by gins to meet such standards. To prevent health departments from taking drastic action against the ginning industry, the Committee urges an immediate expansion of research on air pollution control and trash disposal at ginning plants.

UNILIATION RESEARCH

Research Areas of Highest Priority

The Committee commends the Department for its excellent research on durable press and urges that research in this area be accelerated.

In view of the rapid increase in the use of man-made fibers, the Committee urges an immediate expansion of research to increase the use of available cotton fiber types through appropriate blends with both man-made and natural fibers.

Research should be expanded immediately to develop new processing techniques, methods and products for the increased utilization of short staple cotton.

Development of new and improved cotton textile products to meet consumer requirements is the quickest and surest path to increasing the utilization of cotton or blends thereof. The Committee urges that basic research on yarn and fabric structures, and research on new products, be intensified.

Cotton Products with Special Properties

The Committee expresses vigorous approval of the Southern Research and Development Division's efforts in this area. However, greater research effort should be made on the development of cotton products with special properties. Specifically, the Committee recommends the following actions be taken:

1. Intensify research on the use of combinations of physical and chemical phenomena for the development of yarn and fabrics having new and useful properties desired by the consumer.
2. Expand investigations on the effects of substitute groups in cotton on the physical properties such as abrasion resistance, flexibility, tensile strength, extensibility, toughness and related properties.
3. Continue research at the current level to determine the effect of cotton fiber properties and processing machine variables on spinning end-breakage and yarn properties.

4. Substantially expand and emphasize research to produce satisfactory durable (life of garment) and semi-durable (five home laundries) flame retardants for cotton. Particular attention should be given flame retardants which have a supple hand, free of odor, do not yellow and are suitable for use on light weight as well as heavier fabrics.
5. Emphasize research on special and improved properties for cotton such as weather, heat, and chemical resistance, and bulk.
6. Continue development of insect repellent bags for cereal foods.
7. Expand basic research leading to the development of radically new cotton textile processing systems. The Committee is gratified to note that its 1966 recommendation on this subject is being followed.
8. Continue research to emphasize the relationship of fiber physical properties and morphology with changes caused by chemical processes in order to provide sound basic information on the development of new or improved cotton products.

Dissemination of Utilization Research Technology

The Committee commends the Department for the several steps taken to date to disseminate and promote results of its research and to develop a system whereby information concerning the status of research projects can be quickly retrieved and made available.

It again recommends an expanded extension program on cotton utilization research. New technology developed through research is ineffective without strong extension programs in cotton utilization. Every effort should be made to bring this to the attention of industry and other users of cotton products.

Mycotoxins in Cottonseed

The Committee reemphasizes its prior recommendations that the highest priority be given to the continuance and intensification of research on mycotoxins and that the funds required for this priority be made available. Particular attention should be given to the possible transmission of fungal metabolites or their toxic derivatives from feed into milk, meat, and eggs.

The Committee again recommends that research continue at a high level on the inactivation or removal of mold toxins in seed and meal.

Gossypol

It is apparent that ginned varieties of cottonseed will continue to be produced in substantial quantities. Research to remove the restrictions to the use of cottonseed products as feed or food imposed by the presence of gossypol should be continued.

Cyclopropene Fatty Acids

The Committee recommends that work be continued at a level necessary to bring to a conclusion and solve the cyclopropene fatty acid problem in cottonseed and cottonseed meal. The present program which has resulted in a procedure of preparing limited amounts of concentrate from cottonseed oil and in a method for inactivating cyclopropenes in cottonseed appears to be progressing satisfactorily.

World Protein Needs

The present shortage of protein in many parts of the world and the projections that world shortage of proteins will become more acute emphasizes the critical need for fully utilizing cottonseed protein. Expanded research is recommended on developing cottonseed products of the highest value and free of deleterious constituents for food uses.

MARKETING AND ECONOMIC RESEARCH

Pricing of Raw Cotton

The Committee feels that the pricing of raw cotton is still the major problem in the overall area of cotton marketing and economics research. Value as established by the present marketing system does not correlate with the spinning performance of the cotton. Processor desires and preferences are not reflected back through the channels of trade in the form of appropriate price differentials to guide producers in making proper production decisions with respect to adjustments required by the market. Development of a better pricing system is urgently needed. Major advances in this area can be made by:

1. Developing, testing, and perfecting appropriate instruments to measure accurately and rapidly those fiber properties that correlate with spinning and processing performance.
2. Measuring the relationships between fiber properties and spinning performance with predictable accuracy so that spinning performance from any specified combination of fiber properties can be optimized.
3. Learning how to price cotton in terms of fiber properties in a practical manner so that the system can be put into use in the trade.

Research results in areas (1) and (2) show a great deal of promise. Projects in these areas should be continued with all possible speed to develop the necessary instrumentation and fiber property-spinning relationships so that work can be initiated in areas (3) as soon as possible.

The Marketing System

The Committee recommends that research agencies working in cotton marketing cooperate with both private and public organizations in directing research efforts toward improving marketing practices that will lead to increased

efficiency in marketing. Both research and action agencies within the Department who are dealing with marketing problems are urged to exert a unified effort to help bring about the adoption of new technology by the marketing system as rapidly as it becomes available.

Further, it is felt that spot market price quotations frequently reflect false grade and staple premiums and discounts, especially for qualities not commonly produced in the market area. The Committee recommends that studies be initiated in this area of market price information to develop methods which will lead to more meaningful price information.

Government Loan Quality Differentials

Unrealistic market differentials about the base loan price for cotton have resulted in accumulations of burdensome stocks of short staple cottons in CCC hands rather than causing these cottons to move into consumption. The Committee feels that the result is contrary to the intent of public policy and that the siphoning of cottons out of the channels of trade into the CCC Stocks is unhealthy for the industry. It appears that the system of establishing loan differences for grade and staple functions imperfectly when the loan value is higher than market value so that loan differences in the subsequent year are in fact based on the previous years' loan and not on market differences as intended. Under this system of price inflexibility, the loan price prevails and thus prevents the market price for the short staples from making necessary downward adjustments. The Committee urges the Department to recognize this problem and to develop a more realistic method of establishing loan differences so that the market is able to perform its proper function of pricing these qualities of cotton in the channels of trade.

Cotton Characteristics and Market Performance

The Committee recommends the continuation of studies dealing with the relationships of inherent and induced characteristics of raw cotton to manufacturing performance, costs, product quality, and end use value as an integral part of the Marketing Economics Division's research program.

Cooperative Marketing Research

The contribution of research by the Farmer Cooperative Service is of major significance in providing the guidelines for successful cooperative operation in the areas of purchasing, services, and marketing. The Committee recommends continued support of the research at present levels.

Production Costs and Returns

Studies in this area are useful in policy determinations with reference to farm adjustments to markets. The Committee recommends that work be continued in this area to develop costs of producing cotton in the various areas across the Belt and to develop data useful in analyzing production adjustment responses to changing market conditions and public policy programs. Additionally, these data should be updated from time to time as necessary.

Consumer Preference for Cotton

Manmade fibers and blends have moved aggressively into the textile market and provided sharp competition for the natural fibers, making the need for sound information on consumer reactions on a nationwide basis even more urgent. Consumer preference research on cotton, wool and competing materials should be expanded to provide this information. Studies which should be given high priority include consumers' use of and preferences for fibers and fabrics in men's wear, children's wear, and household products. Studies should also be initiated among manufacturers or industrial consumers on their consumption and opinions of cotton in specific end-uses such as medical supplies and automobile interiors. These trends will become useful in guiding other related research efforts and action programs.

